

Claims

1. A paired anastomosis device for holding a first vessel together with a second vessel comprising:

first ring means for providing support for a first vessel at a first vessel opening, wherein the first ring means has a first ring opening,

second ring means for providing support for a second vessel at a second vessel opening, wherein the second ring means has a second ring opening,

wherein each ring means is adapted to expand and contract to enable each respective vessel opening to change in diameter, and

wherein the ring means are configured to be structurally linked in a manner such that the first and second ring means expand and contract in unison and such that the first vessel remains anastomosed to the second vessel at the first and second vessel openings as the first and second ring means expand and contract.

2. The anastomosis device of claim 1, further comprising locking means for locking the first ring means and the second ring means together such that the first vessel and the second vessel remain anastomosed together.

3. The anastomosis device of claim 2, wherein the locking means comprises guide means for guiding the movement of one ring means relative to the other ring means from a loading position with the first ring means offset from the second ring means to an anastomosis position.

4. The anastomosis device of claim 2, wherein the first and second ring means are adapted to cooperate with attachment actuation means for approximating one of the ring means to the other ring means such that the device is moved from a loading position to an anastomosis position.

5. The anastomosis device of claim 1, wherein the first ring means further comprises holding means for holding the first vessel at the first vessel opening, and

wherein the second ring means further comprises holding means for holding the second vessel at the second vessel opening.

6. The anastomosis device of claim 5, wherein the holding means of at least one of the rings means has anchor means for more securely anchoring a vessel on the holding means.

7. A paired anastomosis device for holding a first vessel together with a second vessel comprising:

a first ring having holding surfaces that define a first ring opening, wherein the holding surfaces are adapted to hold a portion of a first vessel defining a first vessel opening such that the first vessel opening is at the first ring opening,

a second ring having a plurality of holding surfaces that define a second ring opening, wherein the holding surfaces are adapted to hold a portion of a second vessel defining a second vessel opening such that the second vessel opening is at the second ring opening,

wherein each ring is adapted to expand and contract to enable each respective vessel opening to change in diameter, and

wherein the rings are configured to be structurally linked in a manner such that the first and second rings expand and contract in unison and such that the first vessel remains anastomosed to the second vessel at the first and second vessel openings as the first and second rings expand and contract.

8. The anastomosis device of claim 7, further comprising a plurality of guideposts extending from one of the rings and a plurality of guides fixedly connected to the other ring, wherein the guideposts are positioned to slide into the guides in order to guide the rings from a loading position to an anastomosis position.

9. The anastomosis device of claim 8, wherein the guides are sized to frictionally engage the guideposts such that the rings are maintained in the anastomosis position after the rings are brought together.

10. The anastomosis device of claim 7, wherein one of the rings has a plurality of legs with locking extensions and the opposite ring has a plurality of legs with slots positioned to receive the locking extensions, such that the rings are maintained in the anastomosis position after the rings are brought together.

11. The anastomosis device of claim 7, wherein each vessel has an intimal layer, and

wherein the holding surfaces of each ring are positioned to capture vessel tissue in an everted configuration so that when the rings are in an anastomosis position the intimal layer of the portion of the first vessel defining a first vessel opening contacts the intimal layer of the portion of the second vessel defining a second vessel opening.

12. The paired anastomosis device of claim 7, wherein each vessel has an adventitial layer,

wherein the holding surfaces of the first ring contact the adventitial surfaces of the portion of the first vessel defining a first vessel opening, and

wherein the holding surfaces of the second ring contact the adventitial surfaces of the portion of the second vessel defining a second vessel opening.

13. The anastomosis device of claim 7, wherein each ring comprises a plurality of flexible segments.

14. The anastomosis device of claim 13, wherein each flexible segment comprises two adjoining arms in a V-shaped configuration.

15. The anastomosis device of claim 13, wherein each flexible segment has a configuration that is selected from the group consisting of a U-shaped configuration, a quadrilateral shaped configuration, a circular configuration, an elliptical configuration, a spiral-shaped configuration, and an oval-shaped configuration.

16. The anastomosis device of claim 13, wherein the holding surfaces of each ring are holding tabs.

17. The anastomosis device of claim 16, wherein each flexible segment of the plurality of flexible segments of each ring is adjoined to an adjacent flexible segment by a connecting joint, wherein each flexible segment of each ring has a flexible segment joint, wherein the holding tabs of the first ring extend from the connecting joints, wherein the holding tabs of the second ring extend from the flexible segment joints.

18. A paired anastomosis device for holding a first vessel together with a second vessel comprising:

first ring means for providing support for a first vessel at a first vessel opening, wherein the first ring means has a first ring opening,

second ring means for providing support for a second vessel at a second vessel opening, wherein the second ring means has a second ring opening,

wherein each ring means is adapted to be in a compressed position as the first vessel and second vessel are anastomosed together such that each respective ring opening and respective vessel opening have an initial diameter, and

wherein at least one ring means is adapted to radially expand to a deployed position after the first vessel and second vessel are anastomosed together such that each ring means and vessel opening has a greater diameter than the initial diameter of each respective ring means and vessel opening.

19. A paired anastomosis device for holding a first vessel together with a second vessel comprising:

a first ring having holding surfaces that define a first ring opening, wherein the holding surfaces are adapted to hold a portion of a first vessel defining a first vessel opening such that the first vessel opening is at the first ring opening,

a second ring having a plurality of holding surfaces that define a second ring opening, wherein the holding surfaces are adapted to hold a portion of a second vessel defining a second vessel opening such that the second vessel opening is at the second ring opening,

wherein each ring is adapted to be in a compressed position as the first vessel and second vessel are anastomosed together such that each respective ring opening and respective vessel opening have an initial diameter, and

wherein at least one ring is adapted to radially expand to a deployed position after the first vessel and second vessel are anastomosed together such that each ring and vessel opening has a greater diameter than the initial diameter of each respective ring and vessel opening.

20. A paired anastomosis device for holding a first vessel together with a second vessel comprising:

a first ring having a plurality of holding surfaces that define a first ring opening, wherein the holding surfaces are adapted to hold a portion of a first vessel defining a first vessel opening such that the first vessel opening is at the first ring opening,

a second ring having a plurality of holding surfaces that define a second ring opening, wherein the holding surfaces are adapted to hold a portion of a second vessel defining a second vessel opening such that the second vessel opening is at the second ring opening,

wherein each ring has a plurality of flexible segments from which the respective holding surfaces extend, and

guides positioned to provide guided coaxial movement of the rings relative to each other so that the rings can be moved from a loaded position with the first ring offset from the second ring to an anastomosis position with the first vessel is anastomosed to the second vessel at the first and second vessel openings,

wherein the plurality of flexible segments of each ring are adapted to enable each respective ring opening and respective vessel opening to change in diameter as each ring expands and contracts in response to changes in fluid pressure.